PRINTER RUSH
(PTO ASSISTANCE)

Application :	09/990408	**Examiner :**	ICM	**GAU :**	3729
From:	CA	**Location:**	(IDC) FMF FDC	**Date:**	

Tracking #: 06091144 Week Date: 3/28/05

DOC CODE	DOC DATE	MISCELLANEOUS
☐ 1449		☐ Continuing Data
☐ IDS		☐ Foreign Priority
☐ CLM		☐ Document Legibility
☐ IIFW		☐ Fees
☐ SRFW		☐ Other
☐ DRW		
☐ OATH		
☐ 312		
☒ SPEC	4/24/01	

[RUSH] **MESSAGE:** pages 3, lines 13-15, p. 5 lines 5 & p. 11 lines 4-5 p. 12 line 6 of the specification are missing text.

Please Resolve.

Thank You

CA

[XRUSH] **RESPONSE:**

Corrected

See Attachments

INITIALS: BP

NOTE: This form will be included as part of the official USPTO record, with the Response document coded as XRUSH.

REV 10/04

09/990408

BURGESS & BEREZNAK
800 West El Camino Real, Suite 180
MOUNTAIN VIEW, CALIFORNIA 94040
(650) 903-2264 (Telephone)
(650) 903-2280 (Facsimile)

A LIMITED LIABILITY PARTNERSHIP INCLUDING LAW CORPORATIONS

FACSIMILE TRANSMITTAL SHEET (TRANSMITTAL TO USPTO)

Deliver to: K. Pinkney
Firm Name: U.S. PATENT AND TRADEMARK OFFICE
Fax Number: (703) 308-6642 Telephone No.:
From: Bradley J. Bereznak (Reg. No. 33,474)
Date: May 09, 2005 **Time:** 2:20 p.m. PDT
Operator: crb **Matter:** 073600.P020D
Number of pages including cover sheet: 5
In Re Patent Application of: Kubota, K.
Application No.: 09/990,740832 **Filed:** Nov. 21, 2001
For: Magnetic Head Device, And Method Of Its Manufacture

Enclosed are the following documents: Dear Ms. Pinkney, In accordance with our phone conversation earlier today, attached are copy of pages 5, 9, 11, and 12 from the original specification for the above case.

Please call me, if you have any questions or should require anything further. Thank you for your attention to this matter.

Sincerely,

Bradley J. Bereznak

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being facsimile transmitted to the Patent and Trademark Office on:
Date of Transmission May 09, 2005
Bradley Bereznak
(Typed or printed name of person transmitting paper)

(Signature of person transmitting paper)

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention detailed illustrated by way of example and not limitation in the accompanying figures.

Figure 1 is an expanded cross-sectional diagram of principal parts of a magnetic head device of one embodiment of this invention.

Figure 2 is a cross-sectional diagram of the same magnetic head device.

Figure 3 is an expanded plane diagram of the magnetoresistance effect element of the same magnetic head device.

Figure 4 is a plane diagram of the state of formation by layering in a lattice array of numerous thin film magnetic head elements on a wafer surface, in the manufacturing process of the same magnetic head device.

Figure 5 is an expanded diagram of Figure 4.

Description of Symbols

1	Magnetic head device
2	Substrate (slider)
3	Thin film magnetic head element
4	Reproduction element part (magnetoresistance effect head)
5	Magnetoresistance effect element
R	Magnetically degenerated layer

09/990408

in the thin film magnetic head element containing the magnetoresistance effect element, without the MR element stripe height becoming too thin. And it is thought that, with respect to the magnetically degenerated layer, the nearer to the surface layer part, the greater is the machining strain, so that by removing the surface layer part, the output characteristic is greatly improved.

In the present invention, which is based on this knowledge, a method of manufacture of a magnetic head device with a thin film magnetic head element formed by layering on a side surface of a slider, including a process of forming by layering on a side surface of a slider a thin film magnetic head element having a magnetic reproduction element part principally comprised of a magnetoresistance effect element, and a process of polishing the side surface of the magnetic head device opposing the magnetic recording media, is characterized by the inclusion of a process, after the aforementioned polishing process, in which dry etching is used to remove material in a region containing at least the component layers of the aforementioned magnetic reproduction element part on the surface opposing the magnetic recording media, until a depth of 1/30 or greater but less than 1/10 the stripe height of the magnetoresistance effect element immediately after the polishing process. In this way, if the etching depth is determined as a proportion of the stripe height, using, for example, some convenient means of stripe height

head for reproduction and an inductive head for recording, when using aluminum nitride or similar as the material comprising the reproduction magnetic gap layer of the magnetoresistance effect head, and when using silicon oxide, tantalum pentoxide, a beryllium-copper alloy or similar as the material comprising the recording magnetic gap layer of the inductive head, these component materials have, compared with alumina, polishing properties close to those of the shield layer in magnetoresistance effect heads and the component materials (permalloy and so on) of the magnetic poles of inductive heads. Thus by means of mechanical polishing of the ABS, the end surface on the side opposing the magnetic recording media of the thin film magnetic head element is flattened over multiple component layers. Hence this invention can be especially advantageous in the case of magnetic head elements using such component materials.

In cases where the depth of the MR element changes with the width direction, the stripe height in this invention is the maximum depth within the effective region for magnetic field detection.

Below embodiments of the invention are explained, referring to the drawings.

Figures 1 to 3 show the magnetic head device 1 of an embodiment of this invention. The magnetic head device 1 is constructed by the formation by layering of a thin film magnetic head element 3, consisting of

09/990408

multiple component layers, on the surface on one side of a slider (substrate) 2, that is, on the trailing-side surface. The element 3 is constructed by layering vertically in an integrated manner a magnetoresistance effect head for reproduction 4 (a magnetic reproduction element part principally comprised of a magnetoresistance effect element 5) and an inductive head for recording 6 (a magnetic recording element part principally comprised of an electromagnetic coil 7 and upper and lower magnetic poles 8, 9).

The magnetoresistance effect head 4 is constructed by layering in order, on top of an AlTiC substrate 2 (Al_2O_3-TiC substrate) on the surface of which is layered an undercoat 10 consisting of a nonmagnetic material, a lower magnetic shield layer 11 consisting of a soft magnetic material; a lower-half gap layer 12 consisting of a nonmagnetic material; a magnetoresistance effect element film 5 the electrical resistance of which changes in response to an external magnetic field; an electrode layer 13 connected to both ends of the film 5; an upper-half gap layer 14 consisting of a nonmagnetic material; and an upper magnetic shield layer 8 consisting of a soft magnetic material.

As the component materials of each layer, for example, alumina (Al_2O_3) can be used as the undercoat 10; permalloy (NiFe alloy), FeAl alloy, or a Co-base amorphous alloy as the magnetic shield layers 8, 11; aluminum nitride (AlN) or aluminum nitrate ($AlNO_3$) as the magnetic gap